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ABSTRACT

This study employs a unique longitudinal data base to examine the effects of home environment characteristics on the school performance of black, inner city children from low income families. In particular, it estimates the effects on three measures of school performance; (1) vocabulary test scores, (2) reading test scores, and (3) attendance, of modifiable aspects of the home environment, such as the labor force activity of the parents, housing quality, nutrition, health care consumption, durable goods ownership, and income. The primary hypothesis of the study is that the quality of the home environment influences school performance. The study considers two samples of students from families who participated in the Gary income maintenance experiment. One includes students for whom performance indicators were available for the two successive years ending with the fourth, fifth, and sixth grades; the other includes individuals for whom performance data were available for both the third and fifth grades, or fourth and sixth grades, or the sixth and eighth grades. The results suggest that performance, particularly as measured by test scores, may be directly influenced by policies that affect housing quality or nutrition, and indirectly influenced by programs that change household income. The results complement those of previous studies and suggest areas for more careful, in-depth analyses. Public policies that improve certain aspects of the home environment, such as housing quality or nutrition may produce improvements in the school performance of children. (Author/AM)

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THE EFFECTS OF HOME ENVIRONMENT ON SCHOOL PERFORMANCE

by

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ABSTRACT

THE EFFECTS OF HOME ENVIRONMENT ON SCHOOL PERFORMANCE

This study employs a unique longitudinal data base to examine the effects of home environment characteristics on the school performance of black, inner-city children from low income families. In particular, it estimates the effects on three measures of school performance--vocabulary test scores, reading test scores, and attendance--of modifiable aspects of the home environment, such as the labor force activity of the parents, housing quality, nutrition, health care consumption, durable goods ownership, and income. The results suggest that public policies to improve certain aspects of the home environment, such as housing quality or nutrition, may produce improvements in the school performance of children. They also suggest additional avenues of investigation that may further our knowledge of the educational benefits associated with various public policy options.

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INTRODUCTION

This study investigates the relationships between modifiable aspects of the home environment and each of three measures of school performance--vocabulary test scores, reading test scores, and attendance--using two samples of elementary school students whose families participated in the Gary negative income tax experiment. The primary hypothesis is that the quality of the home environment influences school performance. However, the study also focuses on the estimation of relationships between the various performance measures and such factors as the labor force activity of the parents, food expenditures, health care consumption, income, assets, and family and personal demographic characteristics. The results of the study complement those from the limited research which has previously attempted to estimate the expected effects on school performance of alternative public policies that influence the home environment, such as those related to welfare reform, public employment, and housing.[1/]

The first section of this report reviews some of the most relevant literature--in particular, that which was conducted as a part of the evaluations of the New Jersey-Pennsylvania and Rural negative income tax experiments. The second describes the sample and data used in this analysis. Finally, the results are summarized and discussed in terms of their policy implications.

[1/] Aaron (1977) provides a review of some of the most important of these studies.

I. REVIEW OF THE LITERATURE

The education literature has tended to suggest that, overall, the home is relatively more important than the school in determining educational outcomes (Coleman et al., 1966; Jencks et al., 1972). However, there has been very little research aimed at determining which specific aspects of the home environment are important and for which types of students they have the greatest effect. Also, virtually no effort has been made to identify public policy means to improve school performance by inducing changes in the home environment. The deficiencies in our current knowledge may largely be attributed to the unavailability of longitudinal performance and environment data which will permit an investigation of factors that are associated with changes in, as well as levels of, performance indicators. (Factors that correlate with performance, perhaps because of their importance in early childhood development or inheritance, for example, may not have direct (causal) effects on performance.)

The recent wave of large-scale social experiments--most notably the negative income tax experiments--which directly changed the economic status of families and measured the induced home environmental changes, permit us to investigate more thoroughly the extent to which modifiable aspects of the environment influence school performance. These results will be important to education policymakers in that they address the issue of whether causal relationships exist between modifiable aspects of the environment and school performance, especially among the low income population in which income undoubtedly constrains

environmental quality. The results are important to welfare reformers in that they provide information related to the long-run benefits of alternative welfare programs. If the positive correlations observed between income and school performance measures[1/] indicate causal relationships, then a program of cash transfers should tend to break the "cycle of poverty." This section will discuss some results of small-scale demonstrations and those from the New Jersey-Pennsylvania and Rural negative income tax experiments which provide evidence that such causal relationships exist between school performance and the home environment (as well as income, which is a constraint on the home environment's quality). However, first we review some noteworthy findings based on cross-sectional analyses.

THE RESULTS OF CROSS-SECTIONAL ANALYSES

The most consistent findings of these studies include positive relationships between school performance indicators and the education levels of the parents, family income, socioeconomic status indices, reading materials in the home, and durable goods ownership (for example, see Averch, 1972; Duncan, 1974; and Flanagan, 1962). However, the underlying studies generally include only crude indicators of selected home environment factors at one point in time; it is expected that many potentially relevant factors have either not been measured at all or were measured poorly. Consequently, the results tend to suggest simply that significant relationships <u>may</u> exist, rather than identifying particular policy modifiable factors that are important.

[1/] Such correlations are usually in the area of .2 to .3 (Jencks, 1972).

Another group of studies (Lindert, 1974; Liebowitz, 1974, 1977; Hill and Stafford, 1972; and Dugan, 1969) suggests that the allocation of parental time to children may significantly affect performance. However, these studies were unable to control for differences in school resources and, furthermore, may have been plagued by an inability to disentangle the effects of factors such as parental motivation from those of specific time allocations.

Yet another set of studies considers the relationships between performance and particular aspects of the environment. For example, Birch and Gussow (1970), Wray (1971), and Hurley (1969) have identified strong correlations between performance indicators and such factors as nutrition, health care, and housing characteristics. Kaplan et al. (1972) provides some more persuasive evidence that the differential availability of health care services between similar samples may lead to performance differences. Similarly, Wilner and Walkley (1963) provide evidence that induced changes in housing quality will affect attendance and promotion rates, and probably would also affect academic performance.

ENVIRONMENTAL INTERVENTION STUDIES

Small-Scale Demonstrations

Prior to the recent wave of large-scale social experiments, only a few very small-scale demonstrations had been conducted in an attempt to measure directly the effects of various induced modifications in the home environment (for example, see Gordon, 1971; Parker, 1970; Butler, 1970; Heber, 1973). These studies typically involved the

provision of an "enriched" home or surrogate home environment for preschoolers or early elementary school students, where the enrichment might have involved improved nutrition and medical care, increased audio, visual, and tactile stimulation, and greater amounts of parental interaction with the child. In most cases, the programs seem to have resulted in improved performance; however, the achievement gains tended to fade after the termination of the treatment. Due to both the small sample sizes and insufficient variation among the measured treatments, it has not been possible to identify those particular aspects of the programs that seemed to have "worked." Furthermore, sample selection procedures precluded drawing any inferences regarding the characteristics of children for whom such programs will work.

Analysis of the New Jersey-Pennsylvania Experiment Data

The negative income tax experiments were conducted to estimate the labor force participation response associated with replacing the current welfare system with various guaranteed income levels in combination with positive tax rates on earned and other unearned income.[1/] However, the attractiveness of such a program depends also on the extent to which it induces improvements in education that will lead to higher future earnings and, consequently, to a reduction in

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[1/] Two experiments have been completed and the primary evaluation of the programs distributed--the New Jersey-Pennsylvania and the Rural experiments. The Gary, Indiana, experiment has been completed, but the initial evaluation is still being conducted. The Seattle-Denver experiment is now closing out its experimental operations, and its evaluation is underway.

long-run dependence on welfare programs. For this reason, the evaluations of the New Jersey-Pennsylvania and the Rural experiments included studies of the programs' effects on school performance, and similar studies are planned in conjunction with both the Gary and the Seattle-Denver experiments. It is noteworthy, however, that because of the experiments' focus on low income families (current or potential welfare recipients), the samples of school children are not representative of the nation's school children or of all school children in the experiments' respective localities.[1/]

The New Jersey experiment's data base included longitudinal information on educational attainment, along with basic background and experimental treatment information for a sample of about 1,300 families in four cities in New Jersey and one in Pennsylvania. These data permitted an investigation of short-run effects of the negative income tax program on the educational attainment of young adults who were beyond the age limits of compulsory education laws (Mallar, 1975, 1977). (School records data to permit an investigation of academic achievement and attendance were not collected.)

The results of the study show that teenagers whose parents were enrolled in one of the negative income tax plans were between 20 and 90 percent more likely than their counterparts in the control group (depending on the particular income guarantee and tax rate plan they were enrolled in) to complete high school. Similarly, it was estimated

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[1/] Table 2 presents characteristics of the New Jersey-Pennsylvania, the Rural, and Gary experiment samples, along with comparable characteristics for the nation as a whole.

that by age 19 to 20, participants in the experiment had completed, on average, one-third to one-and-a-half more years of formal education after their families received negative income tax payments for only three years.

An effort was made to determine whether or not there were significant differences in these educational responses associated with the level of the income guarantee and the tax rate. The estimated effect of the program's tax on income was surprisingly large and statistically significant for both high school completion and educational attainment. The fact that the increases in the tax rate led to significant increases in educational attainment may suggest that a change in the opportunity cost of attending school has a more decisive impact on educational incentives than is commonly perceived.[1/] No effects of variations in the guaranteed income level were identified.

This study also estimated the effects of participation in the various negative income tax plans on the probability that high school graduates would attend college. These results suggest that the program was associated with a substantial increase in the probability of students attending college, conditional on the completion of high school.[2/] However, these results were not statistically significant.

[1/] The higher tax rates may also induce parents (particularly mothers) to reallocate their time from market work to education-related activities with their child(ren).

[2/] The minimum estimated effect of the program was a 70 percent increase in the probability of attending college, given high school completion.

When the estimated effects of the experiment on high school completion and on college attendance were combined, it was estimated that individuals whose families participated in the experiment were between two and four times more likely to attend college than their control counterparts.[1/] These results did not seem to vary in regard to the particular program tax rate and guarantee level.

The New Jersey study is limited in a number of respects. It considers only the effect of the negative income tax experiment compared with the status quo, which includes the existing welfare system. Also, because of data limitations, it was not possible to consider the program's effects on other dimensions of performance which would provide insights into the mechanisms through which the experiment induced the estimated educational attainment and college attendance responses. Finally, the sample was small (138 observations) and included several potentially important stratifications defined by city of residence and ethnicity which needed to be controlled for in the analysis, thereby reducing the power of the estimates.

The Analysis of the Rural Experiment Data

The data base for the Rural experiment included longitudinal information on the school performance of children and the resource supply characteristics of their schools. These data, in combination with quite detailed profiles on each child and his/her home environment during the three-year period when the experiment was conducted,

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[1/] The statistical significance of this result was not reported.

permitted both a more rigorous investigation of experimentally induced effects on school performance than was possible in the New Jersey-Pennsylvania study, and an investigation of home environmental factors that influence school performance. While the sample of 847 second through twelfth graders included too few high school dropouts for an analysis of educational attainment, it was adequate for analyses of attendance, academic grades, and standardized test scores.[1/] Due to observed behavioral differences, the study analyzed Iowa and North Carolina children separately, and within each regional sample, it considered second through eighth graders separately from ninth through twelfth graders (Maynard, 1977a, 1977b).

The Direct Effects of the Experiment. The largest and most significant responses to the experiment were found in the sample of second- through eighth-grade students from North Carolina families. These children exhibited statistically significant responses for all measures of school performance. Favorable experimental responses included a 31 percent reduction in absences, a 6 percent increase in academic grade point average, and a 19 percent improvement in the grade equivalent score measure. The percentile scores on standardized achievement tests also rose for second through eighth graders in the experimental group, compared to the control group, but the adjusted mean differential was relatively small and not statistically significant.

[1/] The study also considered the effects on comportment grades. However, these results are not discussed below.

The sample of older children from North Carolina families did not exhibit any significant experimental responses. The adjusted mean value for academic grades was 4 percent higher for children from experimental families, but this finding was not statistically significant. There was virtually no difference between the experimental and control groups in terms of number of days absent per year.

While the above estimates of experimental responses for younger children from North Carolina families support the general hypothesis that a negative income tax program will result in improved school performance, the findings for the Iowa samples provide no support for this hypothesis: none of the adjusted mean differences in school performance between the experimental and control groups in Iowa was statistically significant. Those children from experimental families did reduce their absences; however, both academic grades and achievement test scores tended to be lower for children whose families were enrolled in the experimental negative income tax program than those of other children, although the difference is not statistically significant. This general lack of effect for the Iowa sample may be due to the fact that, unlike those in the North Carolina sample, these families seem to be in poverty for reasons other than lack of formal education (e.g., due to misfortune or to a lack of motivation). Also, the Iowa sample, compared to the North Carolina sample, is all white, relatively better off economically, and performed near the national norm on standardized achievement test scores before enrolling in the experiment. Thus, it may be that a cash transfer program like the negative income tax will lead to improved performances of only the more economically and educationally deprived students.

In summary, the program responses tended to be larger and more significant for children in the lower grade levels, whose behaviors are easier to modify. Also, for children at all grade levels, the program responses were larger for attendance than for academic grades or test scores, which tend to depend on the effects of past behavior through the stock of knowledge.

Investigations of whether the program response varied depending on the expected amount of the transfer payment or preprogram characteristics of the individual and his/her environment revealed only one consistent finding: there was a greater reduction in absences as the expected payment level increased. This seems to suggest that there is a strong causal link between income and attendance for low income children.

Modifiable Home Environmental Influences on Performance. The somewhat encouraging results of the analysis of the direct effects of the Rural negative income tax experiment on school performance (in particular, the significant effects observed for North Carolina second through eighth graders) led to a subsequent study which attempted to identify those modifiable aspects of the environment that may have lead to such performance changes. This study took advantage of the rich home environment data collected through 12 quarterly interviews with parents to investigate the determinants of attendance, academic grades, and standardized achievement test scores.[1/]

[1/] Again, an analysis of comportment grades was also conducted, but the results were sufficiently uninteresting not to have been reported in other than the primary research report (Maynard, 1975).

Specifically, the study considered the effects of various goods and time inputs (the availability of a TV, an encyclopedia, newspapers, and magazines; nutrition; crowding of the dwelling unit; the availability of a study area; family assets (mainly durable goods) and income; the amount of time the mother spent in the home, whether she worked, the estimated amount of time spent on the care of pre-schoolers, and an index of parent-child companionship; and the number of hours per week children spent on chores).

The set of goods inputs as a whole seemed to bear a significant relationship with the attendance of high-school-age children in both regions and with the academic grades of Iowa second through eighth graders. In addition, each measure of performance seemed to be influenced by specific factors. Relatively consistent results across samples and outcome measures were observed for (1) learning materials such as encyclopedias and magazines, (2) environmental quality factors such as the number of rooms per household resident and the availability of a study area, and (3) family constraints such as assets and income.

In general the presence of an encyclopedia seems to affect favorably both measures of academic performance: children from families who own an encyclopedia earn up to 11 percent higher academic grades and score about one-half a grade equivalent score higher than other children. While the results are strong for both older and younger children, it seems probable that the significant relationship observed for the younger children simply suggests that homes that own an encyclopedia also have other attributes which lead to higher performance. Older children are likely to benefit from the actual availability of the books.

Both the quality of newspaper(s) and the number of magazines subscribed to tend to relate positively to performance, particularly for older children. However, newspapers seem to be more important in Iowa, and magazines more important in North Carolina. This may be partially explained by the lower quality in the available newspapers in North Carolina.

The number of rooms per household resident generally related positively to performance, and in several cases, these relationships were statistically significant, though of moderate size. Increasing living space by one-half room per person was estimated to increase school attendance by up to two and a half days per year, academic grades by about four percent, and test scores by over one-third of a grade equivalent.

The availability of a study area exhibited positive relationships with all dimensions of performance except test scores. Those coefficients estimated for the older compared to the younger children tended to be relatively large (up to four fewer absences and 9 percent higher grades), and generally they were statistically significant. It has been suggested that the fact that homework is much more prevalent at the upper grade levels may explain the observed greater importance of study areas for high-school-age compared to elementary-age children.

Overall, gross assets seemed to be positively related to the performance of ninth through twelfth graders, but not to the performance of second through eighth graders. However, except for attendance of these older children, the coefficients were neither statistically

significant nor large. This lack of effect on academic performance may be due to the fact that many of the more important assets were considered explicitly in the analysis.

Similarly, the effects of income were mixed. Increases in income (controlling for other factors) tended to be associated with decreases in performance, but these relationships were not statistically significant. Because income was included only to control for unmeasured goods inputs whose presence was conditioned by the availability of income, and because of the sample characteristics, these results do not necessarily contradict the positive relationships between income and performance which have been observed in other studies.

Finally, increases in the total amount of income-conditioned unearned income were associated with reductions in all dimensions of school performance for Iowa children, and some of those coefficients were statistically significant, though not large. The coefficients estimated for the North Carolina samples exhibited no consistency in their signs, and they were never statistically significant. This regional difference may be attributable to a much greater social stigma being attached to the receipt of welfare in Iowa, as compared to North Carolina, especially among this sample of individuals who are transitorily, as opposed to permanently, poor.

Neither the presence of a television set or nutrition seemed to influence the performance of this sample, at least in the short-run. These findings may be due to the nearly universal presence of a working television and the high rate of home food production among the farm families.

Overall, the set of time input factors appeared to be important determinants of each dimension of performance for North Carolina second through eighth graders, but it was generally unrelated to the performance of the other samples. Within this sample of North Carolina second through eighth graders, different measures of time inputs tended to be relevant for the various performance measures.

The mother's time out of the labor force exhibited positive associations with performance. At the extreme, the estimated effect of having a mother who is a full-time homemaker, as opposed to a labor force participant, ranges up to a four-day increase in attendance and a 15 percent increase in academic grades. However, only two of the estimated coefficients were statistically significant: the coefficient for the academic grades of North Carolina grade-school children, and the coefficient for the attendance of North Carolina ninth through twelfth graders.

The estimated amount of time spent on the care of preschool-age children is negatively associated with attendance and positively related to the other two measures of performance (academic grades and test scores). The negative association with attendance is consistent with prior expectations, since the presence of preschool-age children increases the probability that (1) illnesses, such as colds, will be transmitted to school-age children, and (2) child care provisions are available for an ill school-age child. The positive associations with the other outcome measures seem to suggest that there may be joint products of the mother's time.

In general, the amount of parent-child companionship is associated with considerably better performance among the second through eighth graders. However, only two of the estimated relationships were statistically significant, and those estimated for the older samples were usually negative but never significant.

The final time variable considered was the average number of hours spent on home and farm chores. Since chore time takes away from time that could be spent in education-related activities, it was expected to be associated with lower performance. While the signs of the estimated coefficients varied somewhat across samples and among the outcome measures, the tendency was for chore time to lead to improvements in all performance measures for North Carolina second through eighth graders, and to lower the performance of ninth through twelfth graders in both regions. The results are generally not statistically significant, but they may suggest that, for this younger group, having regular chores provides a discipline which leads to either relatively greater time allocation to education-related activites or generally greater efficiency of time use; for the older group, the results suggest that chores may interfere with school work.[1/]

Overall, this study provides evidence that for low income samples, both goods and time inputs are important determinants of school performance. In particular, the availability of an encyclopedia, quality newspapers and magazines, the number of rooms per person in the dwelling

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[1/] It is noteworthy that many of these children worked considerable amounts of time on the farm, especially during seasons of peak farm activity.

unit, the availability of a study area, and the mother's time out of the labor force tend to have the expected positive effects on school performance. The amount of chore time and time spent on the care of preschoolers seem to affect performance, but not always in the expected ways: chores have a favorable effect on the performance of younger children, and increased time spent on the care of preschoolers may have spillover benefits in terms of the performance of the school-age children in the family.

SUMMARY

Previous research suggests that there are policy means to improve school performance by inducing changes in the home environment. The results of the New Jersey-Pennsylvania experiment suggest that improving the economic status of low income families will result in a lower dropout rate, higher levels of attainment, and a higher probability of attending college if students graduate. Among the Rural experiment sample, on the other hand, the cash transfers had significant positive effects on the attendance, academic grades, and test scores of only a subsample of the students--the younger children in North Carolina. The program had virtually no effect for the other children in the experiment. Also, with the exception of some evidence that the tax rate influences educational attainment, it seems that marginal changes in the program's parameters would not significantly alter school performance outcomes. (Unfortunately, neither experiment collected performance data that would permit a replication of the other study.)

The follow-up to the Rural experiment's study of the direct effects of the experiment on school performance suggests a number of possible mechanisms through which public policies (such as negative income tax or alternative income support programs) may induce improvements in performance outcomes. Several goods inputs, whose availability is often constrained by income, seem to improve performance. For example, the availability of an encyclopedia and the number of rooms per resident generally exhibited significant positive associations with the various performance measures, and the availability of a study area seems important in determining positive educational outcomes for older children. Thus, policies that provide or permit consumption of goods of this type may have positive effects on school performance.

In addition, various time input factors were determined to be important influences on performance. The most noteworthy in terms of its policy relevance is the mother's labor force activity. Among the North Carolina sample, at least, it appears that increases in the amount of non-labor-force time of the mother may lead to the improved school performance of children. Also, some of the suggestions by Lindert (1974), Liebowitz (1977), and others gain support from the Rural study's estimates of the relationship between the parent-child companionship scale and performance measures--that parental time spent interacting with children positively affects educational outcomes. Thus, policies such as a negative income tax which tend to increase leisure time of the parents (i.e., by decreasing labor force participation or permitting the purchase or use of labor-saving goods) or that

directly affect parent's time allocations (e.g., by sponsoring family-type activities) may result in better school performance of children.

Despite the favorable results of the studies from the negative income tax experiments, we still do not have the knowledge necessary to design a comprehensive welfare reform policy that properly evaluates its educational impact. Among the questions we need answered are:

> To what extent are the positive as opposed to the null results of these previous studies generalizable to other groups defined by population density, region, ethnicity, income level, or educational background?
>
> What would happen to the results in a longer run program?
>
> Are there income guarantee and tax-rate thresholds below or above which the effect of the program changes?
>
> What induced home environmental changes are responsible for the performance changes?
>
> What other modifiable home environmental factors are associated with performance, and what means are available to induce changes in such factors?

The first three studies from the New Jersey-Pennsylvania and the Rural experiments have made significant contributions to answering the long list of questions, yet we still rely very heavily on information from the results of cross-sectional studies. The current study provides additional information to complement that which is provided by the Rural study of the home environmental determinants of performance in particular.

II. THE SAMPLE AND DATA

This study considers two samples of students from families who participated in the Gary income maintenance experiment:[1] one includes students for whom performance indicators were available for the two successive years ending with the fourth, fifth, and sixth grades; the other includes individuals for whom performance data were available for both the third and fifth grades, or fourth and sixth grades, or the sixth and eighth grades.[2] We also required that home environment data which were collected through interviews administered to parents roughly four times a year from 1970 to 1974 be relatively complete for the years between the two performance observations. Table 1 identifies the total number of children in the Gary experiment sample who were in the proper grades to have been included in the analysis, along with the number of individuals who met the criteria related to the availability of both performance and home environment data.[3] Most omitted observations have incomplete performance data; less than 4 percent of the observations had to be omitted solely because of missing home environment information.

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[1] See Kehrer et al. (1975) for a description of this experiment.

[2] This latter sample was added after we determined that there was insufficient variation in the home environment over a one-year period to permit an investigation of whether the change in a characteristic had an effect on performance other than through its effect on the level of the characteristic.

[3] For ease of reference, all tables are presented at the end of the paper (beginning on page 43).

Like the New Jersey-Pennsylvania and Rural experiment samples, the Gary experiment enrolled relatively low income families who were either eligible to receive welfare at the time they enrolled in the program or who were in a high-risk category for becoming eligible. Thus, the families are similar in many respects to those in the other negative income tax experiments, but they are not representative of the nation's families. Table 2 identifies characteristics of the three experiment samples and compares them with characteristics of the U.S. population.

Descriptive information for the two samples used in this study is presented in Tables 3 and 4. Probably the most noteworthy characteristic of these samples is their relatively poor performance on standardized achievement test scores: between 70 and 80 percent of the students performed below grade level, and on average, students performed about one to one-and-a-half "grade levels" below the norm.[1/] Thus, although the sample selection criteria resulted in a nonrepresentative sample of school children, they may be quite representative of the intellectually impoverished, who are perhaps of greatest concern to education policymakers at this time.

The general demographic characteristics of the samples are similar to those that are usually associated with poor school performance and low school continuation rates: this is a group of black, inner-city students; they come from relatively large families, a high proportion of which have only one parent present; and just about 30 percent of the students' mothers and 20 percent of their fathers completed high school.

[1/] Because of the method by which grade equivalent scores are calculated, this average deviation in performance from the norm should not be interpreted to mean that fourth graders perform like the average third grader, for example. It merely suggests an order of magnitude of the low level of performance. See Averch (1972) or Angoff (1971) for a more complete discussion of the issue.

In terms of potentially modifiable aspects of these children's home environments, there is considerable room for changes in a number of areas which might influence performance. Residences tend to be overcrowded:[1] approximately 15 percent of the sample has at most one-half room per person, and over 40 percent of the children have more than two persons per bedroom.[2] Also, 16 to 18 percent of the students live in homes that do not have central heat. The low rent payments for renters and housing values for homeowners suggest that housing quality may be generally poor.[3]

Family income is below the national average, while household size is above the average. It is also noteworthy that about one-third of family income is obtained from means-tested programs such as AFDC, General Assistance, and the Gary experiment's cash transfers. These samples also report relatively low levels of expenditures on food and health care, which may largely be attributed to these low incomes.[4]

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[1] Residences with fewer than one room per person are considered to be overcrowded (Heilbrun, 1973).

[2] We cannot determine the number of persons with whom each child shares a bedroom.

[3] Virtually all homes do have a private bath and hot water, however.

[4] Estimated annual per person food expenditures (based on monthly snap-shot data) are $360 in this sample, compared to a national average of $568. Similarly, the estimated average annual per person health care expenses were only $120, compared to the national average of $148 (Statistical Abstract of the United States, 1973). It is possible that both food expenditures and health care expenses are underestimated by participants in the experiment because of the availability of Food Stamps and Medicaid, even though the interviews probed for the total cost of food and the value of medical care including that which is paid for through insurance or welfare.

Durable goods other than automobiles and homes are almost non-existent among these samples. The average value of such items is near $1,000, and the maximum value reported was about $5,000.

In general, there is little variation in home environment characteristics over time, perhaps because of the fact that household income is relatively stable.[1/] Also, even though 14 percent of the one-year and 26 percent of the two-year samples moved during the period of observation, their housing characteristics did not change much. Thus, this low variation in factors over time precludes us from considering the effects of changes in, as well as levels of, the home environment characteristics for either the one- or the two-year sample.

[1/] In part, the extent of welfare dependence may be responsible for the observed income stability (the mean changes in income are $42 and $48 per month for the one- and two-year observation samples, respectively).

III. THE RESULTS

This study employs multiple regression analysis to estimate the relationships between various home environmental characteristics and three measures of school performance--vocabulary test scores, reading test scores, and attendance. It does not attempt to identify the determinants of the levels of educational attainment. However, it is expected that factors that influence the academic dimensions of school performance will at least indirectly affect continuation rates and, ultimately, socioeconomic status. Also, the evidence suggesting that schools are important (e.g., see Summers and Wolfe, 1975; Murnane, 1975; Good et al., 1975) leads us to expect that factors which affect attendance will have indirect effects on academic performance and continuation rates. However, these indirect effects are not estimated here.

The general form of the models estimated in this study is:

$$P_t = \alpha_o + \beta_1 H_1 + \ldots + \beta_m H_m + \delta_1 X_1 + \ldots + \delta_n X_n + \gamma P_{t-1} + e$$

where

P_t = a current measure of performance

P_{t-1} = a previous measure of performance

H_i = a set of modifiable home environment factors ($i = 1, \ldots, m$)

X_j = a set of other potentially relevant factors ($i = 1, \ldots, n$)

e = a random error term

Table 5 defines the outcome measures, the specific home environment factors, and other variables which are controlled for in the analysis.

In preliminary analyses, we estimated similar regressions for samples defined by (1) the grade the child was in at the time of the output measure, and (2) the past performance of the child as measured by the vocabulary test score. (We considered two performance groups: one that scored less than one grade level below the norm, and the other which performed better.) However, since the results of Chow-tests suggested that the structural relationships were similar among the grade levels but dissimilar between the performance groups,[1/] the samples were ultimately partitioned only on the basis of past performance. We will not present grade-specific estimates.[2/]

Table 6 includes means and standard errors of analysis variables for the various sample breakdowns, and Tables 7a and 7b present correlations among key variables for the one- and two-year observation

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[1/] The exception was that, for the two-year observation sample, relationships differed both between the eighth-grade sample and the combined fifth- and sixth-grade samples, and between the performance groups. However, the latter difference seemed greater.

[2/] By pooling observations across grade levels, it is possible for a sample to include multiple observations for a single individual. In such cases, there may be correlation among the errors in the regression that are associated with the individual, and thus, an error-components or variance-covariance estimation method might result in estimates with more desirable statistical properties (see Hannan, 1974). However, because the Rural experiment's study generally found no individual error components and because of the added programming necessary to use these techniques, we have used ordinary least-squares in this study.

samples, respectively. Both sets of tables highlight the peculiarities of these samples. However, the most noteworthy characteristics of these samples concern their generally low correlations between the performance measures and home environment characteristics. In more representative samples, correlations of approximately .2 to .3 between test scores and both socioeconomic indicators and parent's education levels have been observed (Jencks, 1972), compared with correlations near zero for income and .05 to .09 for parent's education levels in these Gary samples. In light of the apparent effects of the sample truncation, it may seem surprising that we identify any statistically significant relationships between outcome measures and policy modifiable factors. Those findings are discussed below.

ESTIMATES FOR THE ONE-YEAR OBSERVATION SAMPLE

Not surprisingly, the most significant determinant of current school performance is performance in the previous period. However, there is some evidence that school performance is influenced by various home environment and personal characteristics, some of which may be modifiable in the short run, such as nutrition and the size of the housing unit. Also, the particular school attended explains significant portions of the variance in each performance measure for the lower performance group and in the vocabulary test scores of the higher performance group.[1/] Tables 8 through 10 present the estimated regression

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[1/] Summers and Wolfe (1975) also found schools to be more important for low achievers than for other students.

coefficients and their test statistics for the vocabulary test score, reading test score, and attendance equations, respectively. Below, we summarize the most salient findings from the analysis.

Modifiable Home Environment Factors

Employment of Parents. Previous studies have suggested that the time parents spend with their child(ren) influences school performance, and there is some evidence that labor force participation per se may lead to worsened school performance.[1/] Yet, children in these Gary experiment samples seem to be unaffected by the labor force participation of their parents. Two factors may account for the difference between this study's results and those of previous research. The first is the fact that this study uses a sample whose mothers have low levels of education, and therefore, whose additional time investments in their children are likely to have lower payoffs in terms of educational achievement than similar investments by a more highly educated population. The second factor concerns the confounding influences of being a single parent (single parents constitute a large portion of our sample). The factors which draw a single parent into the labor force may also affect the value of the parent's time investments in their children: the most highly motivated single parents may have entered the labor force, thereby resulting in a selectivity bias in the estimated effect

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[1/] Maynard (1977b) found some evidence that labor force participation of the mother negatively affected performance among the low income sample of students. Hoffman and Nye (1974) review several studies, some of which find that performance effects relate to the mother's labor force activity, while others do not.

of labor force participation on performance.[1/] Thus, while there is no evidence from this study to suggest that a work-conditioned welfare program would have detrimental effects on the school performance of elementary students, because of the possibility of selectivity bias in the estimates, one should be cautious about using these results as evidence to support such a welfare reform measure.

Housing. This study estimated the effects of several housing-related variables on performance. However, only the number of bedrooms per person and residential mobility exhibit significant relationships with the school performance measures.

As in the Rural experiment, the crowding of the dwelling unit seemed to affect the school performance of children in the Gary experiment. Having an average of two or fewer persons per bedroom resulted in higher reading test scores for both performance groups and higher vocabulary test scores for the higher performance group. The effect on school performance of having exactly two persons per bedroom produced the following comparison: the estimated coefficient for the vocabulary test scores of the higher performance group is positive and statistically significant at the 10 percent level, while the estimated coefficient for the reading test scores of the lower performance group is quite large and close to significant.

[1/] We did interact mother's time in the labor force with the number of parents present and found that the mother's labor force participation is independent of performance for both children with one and those with two parents present. Also, whether or not the child lives in an extended family did not seem to be associated with performance.

There is essentially no difference between the effect on test scores of having two or having fewer than two persons per bedroom. Also, the number of bedrooms per person is unrelated to attendance for this sample, while it seemed to be very important for the North Carolina students in the Rural experiment.

These results suggest that some amount of privacy (and perhaps a quiet place to study or less disturbed sleep) may be an important determinant of, at least, academic dimensions of school performance. However, sharing a room with one sibling may be at least as good as having one's own room.[1/] Also, the overall number of rooms per person, which is highly correlated with having fewer than two persons per bedroom, is unrelated to all measures of performance once the number of bedrooms per person is controlled for.

Neither rental value nor homeownership status bears a significant relationship with any of the three performance indicators. However, two factors should be noted. First, rental values may be a poor indicator of housing quality because of subsidies such as those provided by public housing.[2/] Second, the values of owned homes are sufficiently low to suggest that, on average, their quality may be no higher than that of rental units.

[1/] It should be remembered that this variable only approximates the number of persons with whom the child shares a room. A more precisely defined variable, if it had been available, may have led to more conclusive results.

[2/] We did interact rental value with public housing status and found no difference between the effects of rental value for those in and those not in public housing.

A change in residence seems to have a relatively large negative impact on all measures of school performance; for reading scores of the higher performance sample, that relationship is statistically significant.[1/] This negative effect may be due to (1) the circumstances which led to the move (for example, a marital dissolution or an eviction for nonpayment of rent), (2) a decline in housing quality, (3) the social consequences of the move, including a change in schoolmates, or (4) the resultant decrease in school attendance of the child(ren). An investigation of changes in the number of parents in the household and changes in housing quality indicators suggests that the first two possible explanations probably do not apply. Further, the lack of significance of the estimated effects on attendance suggests that the fourth possible explanation is also invalid.

In these equations, public housing residence bears no relationship to performance. However, it is noteworthy that the children of public housing residents are concentrated in two schools (both of which are Title-I schools), and that one is associated with strong positive performance differentials on standardized tests. Since 75 percent of the sample students enrolled in that school reside in public housing, it is unclear whether the particular public housing project in this attendance zone is better than the other housing project, or whether

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[1/] The estimated coefficient for vocabulary test scores of the pooled, higher and lower performance subsamples was similar in magnitude to those estimated for the individual groups, and it was significant at the 5 percent level.

the school is better than the other school (perhaps for reasons related to the proximity of the project).[1/]

Our initial research strategy involved investigating the relationships between performance and household amenities (such as a bathroom, hot water, and heat). However, since virtually all homes had hot water and a full bath, these factors were not relevant for this analysis. Central heat is the only amenity for which variation in its availability occurs (only about 80 percent reported having central heat).

One might expect the availability of central heat to influence health status and attendance, as well as the quantity and quality of home study. Yet no relationship between test scores and the availability of central heat was observed, and those estimated for attendance tended to be zero or negative (e.g., a statistically significant negative relationship was estimated for the attendance equation of the lower performance group; however, it is not clear how we should interpret this result).

Food Consumption. Estimates of the relationship between expenditures per person on food and test scores are always positive and of moderate size. However, only the coefficients estimated for vocabulary test scores of the higher performance group and reading test scores of the lower performance group are statistically significant.[2/]

[1/] We interacted public housing status with a dummy variable indicating enrollment in the particular school and found no significant differences in the performance associated with being in public housing and attending this school, as compared to not being in public housing and attending this school. However, these cell sizes were small.

[2/] In subsequent investigations, we identified a significant positive relationship between average food expenditures up to $30 per

There is no observed relationship between such expenditures and attendance. While, theoretically, better nutrition should reduce both lethargy and school absence, these results suggest that increases in nutrition may result in greater educational output per unit of time input, but they may not affect the amount of time a child devotes to educational activities.

It should be pointed out that our measure is, at best, a proxy for nutrition: there is no information on what was consumed, how it was prepared, the number of persons who consumed it, or what other sources of nutrition were available (e.g., school lunches). Thus, these results should only be used to suggest another avenue of investigation into ways to improve school performance.

Health Care Expenditures. Children in the lower performance group whose families consumed some medical care (only about 30 percent of the sample) performed worse by all three measures than those whose families consumed no health care (the estimates for vocabulary test scores and attendance are statistically significant). Yet, children in the higher performance group did not seem to be influenced by such expenditures. The most obvious interpretation of this result is that, for the lower group, consumption of medical care is related to health problems that impede performance, perhaps partially by

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person per month and both types of test scores. However, expenditures beyond $30 per month seemed to have no additional value in terms of performance effects. (The Rural experiment's study found no effects of dietary adequacy and school performance, perhaps because of the quality of its measure--percentage of RDA consumed--or because of the high level of home food production which led to low variance in the measure.)

limiting attendance. It may be more relevant to estimate the effect on performance of altering the price of medical care (for example, see Kaplan et al., 1972) than to consider the effects of actual expenditures.

Durable Goods. This study considered only two measures of durable goods availability--the presence of a television set and the total value of durable goods (excluding homes and automobiles). Neither of these variables relates with any of the performance measures, perhaps because of the nearly universal presence of a television set (98 percent have one) and the relatively low level of durable goods ownership. Liebowitz (1977) suggests that it may have been more appropriate to consider the effects of owning various specific labor-saving durable goods, such as washing machines, clothes dryers, and dishwashers. Subsequent analysis using these data might provide this more detailed investigation of the effect of labor-saving durable goods on school performance.

Income. Once other factors have been controlled for, neither total income nor its source bears any relationship to performance on standardized tests. There are two possible explanations for the fact that this study does not observe statistically significant associations between income and test performance: the first is that this analysis controls directly for many of the environmental characteristics which are generally constrained by income; the other relates to the sample selection procedure which resulted in a truncation of higher income levels. Nonetheless, the higher levels of income among this sample (e.g., more than $600 per month) do seem to have a rather large positive effect on attendance for both performance groups: students in this

income category attended school over two and one-half more days than those whose families had less income (these results are statistically significant at the 15 percent level for a two-tailed test).

Participation in the negative income tax experiment is associated with a large, statistically significant reduction in attendance for the lower performance group. It is not clear why this result occurs, and in fact, it is quite surprising in light of the results from the Rural experiment's study (Maynard, 1977a).

Other Factors

Household Composition. For children in the lower performance group, vocabulary development seems to be significantly less among children with three or more siblings than among children who live in smaller families. Similarly, reading development is less among children in the higher performance group who live in larger as compared with smaller families. However, the number of siblings does not seem to significantly influence vocabulary development among the higher performance group (though the coefficients are relatively large and negative), reading test scores among the lower performance group, or the attendance of either group.[1/]

Lindert (1974) suggests that sibling spacing and birth order may be even more important for performance than the number of siblings, since these factors condition the types of time inputs and interpersonal

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[1/] It might have been expected that attendance would be adversely affected by larger family size due to the higher probability of the transmission of communicable diseases.

interactions that occur. Subsequent analyses of these data should permit a fuller investigation of the relationship between school performance and family composition.

For this sample, the presence of two parents does not seem to affect any aspect of performance except the attendance of the lower performance group: the presence of two parents increased the expected attendance of this group by over three days per year. This result may be due to special needs (physical and/or psychological) of this group which are difficult to meet when only one parent is available.

Children in the higher performance group whose mothers completed high school attain significantly higher test scores than others. However, neither the test performance of the lower group nor attendance is similarly affected, and the father's educational attainment is unrelated to all three performance measures. Of course, since this is a sample selected because of their relatively low income levels, those parents in this sample with at least a high school diploma may not represent the population of such persons; for this reason, these results may not be generalizable to other samples.

Personal Characteristics. Females scored higher on reading tests than males, especially among the lower performance group. However, both vocabulary development and attendance are similar for the males and females.

Significant relationships were observed between test scores and grade level. Yet, these simply represent an adjustment for the test-scoring mechanism and, therefore, are of no policy relevance.

Finally, the performance measure in the preceding year is the best predictor for each of the outcome variables. Much of the difference between the coefficients on previous test scores for the lower and higher performance groups can be accounted for by the lower reliability of the scores near the extremes of the distribution.[1/]

ESTIMATES FOR THE TWO-YEAR OBSERVATION SAMPLE

The primary reason for adding a two-year observation sample was to increase sufficiently the amount of variation in the independent variables (particularly the change values of modifiable home environment characteristics), to permit us to consider whether changes in specific characteristics influence performance independently of their effects on the levels of environmental qualities. For example, once the effect of housing quality is controlled for, does the fact that it has improved or deteriorated during the period influence school performance? Unfortunately, while the amount of variation in these explanatory variables was greater for the two-year compared to the one-year file, it was still insufficient to permit us to obtain reliable estimates of the independent effects of specific variable changes on school performance.

A second goal in adding the two-year file was to increase the explanatory power of the regressions. It seemed possible that performance changes which result from home environment characteristics may occur relatively slowly, and consequently, that some significant

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[1/] Individuals who score very near the bottom or the top of the raw score distribution are less likely than individuals in the mid-range of the distribution to obtain a similar score upon retest. This phenomenon is sometimes referred to as "regression toward the mean."

relationships may not be observed over a one-year period. In fact, the explanatory power of the equations was not generally greater for the two-year sample than it was for the one-year observation sample. The reason may be that by increasing the period of observation, the simple average values of characteristics during the period may not sufficiently control for the relevant aspects of the environment. In addition, the two-year sample is different; it contains fifth, sixth, and eighth graders rather than fourth, fifth, and sixth graders. Despite the fact that the goals in creating this file were not fulfilled, we present the results of regressions for this two-year sample in Tables 11 through 13. Below, we briefly compare these results with those presented earlier for the one-year sample.

Modifiable Home Environment Factors

The estimated results for this set of variables are generally similar in sign and magnitude to those reported for the one-year sample. However, significance levels often vary between the estimates for the one-year and two-year samples. Noteworthy differences are mentioned below.

Unlike the results for the one-year sample, vocabulary test scores among this lower performance group were significantly higher for children whose fathers were employed more than 30 hours per week than for those who had no father or whose father worked less than that amount. Among the two-year sample, there is no evidence of significant effects on school performance of either the number of bedrooms or the number of rooms per person. Similarly, for this two-year sample,

mobility seems to influence only the attendance of the higher performance group. Within the lower performance group, higher levels of welfare income exhibit a significant positive relationship with vocabulary test scores, and, as for the one-year sample, participation in the negative income tax experiment shows a significant negative relationship with attendance.

Other Factors

The negative effects on vocabulary test scores associated with higher numbers of siblings are even larger and more statistically significant for the two-year than the one-year sample: among the two-year sample, being an only child, as opposed to having some siblings, can result in vocabulary test scores up to one grade level higher. Unlike the estimate for the one-year sample, a significant positive relationship between test scores and the presence of two parents was observed for the reading scores of the higher performance group. The effects of education of the parents on school performance of their child(ren) are similar between the one- and two-year samples, though the significance levels of estimates sometimes vary. Finally, over the two-year observation period, females gained more in both their vocabulary and reading test scores, while over a one-year period, the differential performance between males' and females' vocabulary development was not statistically significant.

IV. CONCLUSION

This study suggests that public policies which alter the home environment may, in fact, have spillover effects on the school performance of children. This analysis investigated the relationships between three performance measures--vocabulary test scores, reading test scores, and attendance--and a variety of modifiable aspects of the home environment. These relationships were estimated for a sample of fourth, fifth and sixth graders for whom performance measures were available for both the start and the end of a one-year observation period, and for a sample of fifth, sixth, and eighth graders for whom performance data were available for the beginning and the end of a two-year period. In the analysis, we further partitioned each of these samples into a lower and higher performance group, as defined by the earlier of the two vocabulary test scores.

The results suggest that performance, particularly as measured by test scores, may be directly influenced by policies that affect housing quality or nutrition, and indirectly influenced by programs that change household income. More specifically, the study identified a number of noteworthy relationships. First, within the one-year observation sample, having two or fewer persons per bedroom improved reading scores for both performance groups and improved vocabulary test scores for the higher performance group. This result supports the finding of the Rural experiment's study--that residential crowding affects measures of academic performance. Also, with the one-year observation period, residential mobility seems to have had detrimental affects on all three outcome measures, while no effect was observed for the test scores of the two-year

sample. This difference between the test scores of the one- and two-year samples may suggest that residential mobility tends initially to retard performance, but that over some longer time period, the student eventually regains these losses.[1/] Expenditures per person on food is positively associated with school performance, as measured by test scores of both the one- and two-year observation samples. Such expenditures, however, do not seem to influence attendance.[2/] Finally, there is some evidence to suggest that income may positively influence school attendance. Yet, there is also some indication that participation in the negative income tax experiment may lead to lower attendance--in fact, this effect may dominate the positive effects of being in the higher income category. A number of other interesting relationships between the performance measures and other aspects of the home environment were also identified. However, they have no short-run policy implications.

These results complement those of previous studies and suggest areas for more careful, in-depth analyses. It seems that housing policies may affect school performance, not only by affecting the student-body composition of the schools attended, but also by affecting general living conditions: the relevant issues are whether the student is able to study effectively at home, gets sufficient rest, and has positive relationships with other household members. Similarly, public policies that affect nutrition, such as the Food Stamp or school lunch programs, may have

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[1/] A subsequent study might explore this issue more thoroughly by dating the move in terms of the proportion of the observation period that elapsed prior to the change in the residence and/or school.

[2/] The Rural experiment's study found no effect of food consumption on performance, perhaps because the high rate of home food production in rural areas limits the variation in nutritional intake.

implications for school performance that generally have gone unrecognized. This issue seems worthy of a more comprehensive evaluation, especially in light of the federal and state emphasis on welfare reform and the recent wave of reforms in school lunch programs.[1] Finally, alternative income support programs may influence performance in a number of ways related to induced reallocations of parents' time and increases in the consumption of goods, such as learning materials, housing, or food. The evaluations of the New Jersey-Pennsylvania and Rural negative income tax experiments provide some direct evidence of positive short-run effects of a particular alternative income support program, compared to those of the existing welfare system, and the Seattle-Denver and Gary experiments' evaluations will supplement our information in this area.

In conclusion, the results of this study provide helpful insights into the expected effects on school performance of certain types of public policies. However, the findings are not always consistent between the performance groups, and they vary somewhat between the analysis using a one-year observation period and the analysis using a two-year observation period. These latter discrepancies are most likely due to the change in the grade-level composition of the sample,[2] although the averaging procedures used to define various aspects of the home environment are also

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[1] For example, it may be possible to pursue this question further by using samples of students from various states or localities in which policies regarding school lunch and/or breakfast programs or Food Stamp bonus values differ.

[2] The Chow test rejected the hypothesis that the structural relationships of the model were similar for the eighth graders and for the fifth and sixth graders. However, because we also identified what seemed to be stronger structural differences between the performance groups and because the sample size was too small to permit a six-way split, we stratified by performance level. This stratification was probably inadequate.

likely to have affected the results somewhat. Overall, the results should provide useful guidance for subsequent research to identify the educational effects of various public policy options.

TABLE 1

POTENTIAL AND USABLE SAMPLE SIZES, BY GRADE LEVEL AND DEPENDENT VARIABLE[1/]

One-Year Observation Sample

Sample	Fourth Grade		Fifth Grade		Sixth Grade		Total[2/]	
	Attendance	Test Scores	Attendance	Test Scores	Attendance	Test Scores	Attendance	Test Scores
Potential Sample	375	375	637	637	389	389	1,401	1,401
Usable Sample	255	282	488	430	275	226	1,018	938

Two-Year Observation Sample

	Fifth Grade		Sixth Grade		Eighth Grade		Total[3/]	
	Attendance	Test Scores	Attendance	Test Scores	Attendance	Test Scores	Attendance	Scores
Potential Sample	207	207	389	389	345	345	941	941
Usable Sample	124	132	259	215	175	227	558	574

[1/] About 4 percent of the potential sample had to be eliminated because of missing home environment data. The remainder of the difference between the potential and usable sample is cases with incomplete performance information.

[2/] These numbers include fourth graders in the 1972-73 and the 1973-74 school years, fifth graders in the 1971-72 and the 1973-74 school years, and sixth graders in the 1972-73 and 1973-74 school years.

[3/] These numbers include fifth graders in the 1973-74 school year, sixth graders in the 1972-73 and 1973-74 school years, and eighth graders in the 1972-73 and 1973-74 school years.

TABLE 2

CHARACTERISTICS OF THE GARY, RURAL, AND NEW JERSEY-PENNSYLVANIA NEGATIVE INCOME TAX EXPERIMENT SAMPLES AND OF THE U.S. POPULATION

Characteristic	Gary Experiment Sample[1]	Rural Experiment Sample[1]		New Jersey Experiment Sample[1] (All Sites)	U.S. Population
		North Carolina	Iowa		
Average Family Income ($)	5,200	3,645	3,997	4,252	9,433[3]
Percent of Families with Income Below Poverty Level	44	62	37	31	10[3]
Average Years of Education of Head	9	8	11	9	12[3]
Percent Female Headed Families	60	13	13	2	11[2]
Percent Farmers	0	30	50	0	5[2]
Average Family Size	5	7	6	6	4[2]
Percent Black	100	68	0	37	11[2]
Percent Spanish-speaking	0	0	0	31	3[2]

[1] Source: The screening and preenrollment interviews for the Experiment.

[2] Source: U.S. Bureau of the Census, Statistical Abstract of the United States, 1970.

[3] Source: U.S. Bureau of the Census, Statistical Abstract of the United States, 1971.

TABLE 3

SAMPLE PROFILE:

PERCENTAGE DISTRIBUTION AND AVERAGES OF ONE-YEAR

OBSERVATION SAMPLE CHARACTERISTICS, BY GRADE LEVEL

Variable Description	Grade Level			
	Four	Five	Six	Total
Days Attended School--Post[1/]				
<160 Days	12	12	16	13
160-169 Days	23	20	13	19
≥170 Days	65	68	71	68
Average Days Attended School--Post	170	170	169	170
Days Attended School--Pre				
<160 Days	7	9	11	9
160-169 Days	21	21	17	20
≥170 Days	72	70	72	71
Average Days Attended School--Pre	172	171	171	171
Vocabulary Test Score--Post[2/]				
<-10	43	59	55	54
(-10)-(-1)	28	23	23	24
≥ 0	29	18	22	22
Average Vocabulary Test Score--Post	-7	-14	-13	-11
Vocabulary Test Score--Pre				
<-10	28	54	58	47
(-10)-(-1)	48	24	22	31
≥ 0	24	22	20	22
Average Vocabulary Test Score--Pre	-6	-10	-13	-10
Reading Test Score--Post				
<-10	44	64	68	59
(-10)-(-1)	34	24	16	25
≥ 0	22	12	16	16
Average Reading Test Score--Post	-9	-15	-17	-14

[1/] Post-attendance figures exclude 236 persons, and pre-attendance figures exclude 113 persons for whom data were missing.

[2/] Test Scores are defined as the observed score minus the expected grade equivalent score given the student's grade at the time tested times 10.

Table 3 (Continued)

Variable Description	Grade Level Four	Five	Six	Total
Reading Test Score--Pre				
<-10	39	52	64	51
(-10)-(-1)	36	35	22	32
≥ 0	25	13	14	17
Average Reading Test Score--Pre	-7	-11	-14	-11
# Children in Family				
1	5	5	8	5
2-3	29	30	28	29
4-5	35	33	32	32
> 5	31	33	32	32
Average # Children in Family	5	5	5	5
# Parents Present				
1	56	58	59	58
2	44	42	41	42
Years of Education--Mother[1/]				
<12	61	67	70	66
12	35	29	27	30
13-18	4	4	3	4
Average Years of Education--Mother	10	10	10	10
Years of Education--Father[2/]				
<12	75	77	81	77
12	20	18	14	18
13-18	5	5	5	5
Average Years of Education--Father	10	10	9	9
Hours Per Week Employed--Mother				
0	85	79	79	81
1-20	4	8	3	5
>20	11	13	18	14
Average Hours Per Week Employed--Mother[3/]	28	28	33	30

[1/] Excludes 9 cases where no mother is present.

[2/] Excludes 523 cases where no father is present.

[3/] Excludes 762 cases where the mother was not present or not employed.

Table 3 (Continued)

Variable Description	Grade Level Four	Five	Six	Total
Hours Per Week Employed--Father				
0	14	12	14	13
1-30	5	5	4	5
>30	81	83	82	82
Average Hours Per Week Employed--Father[1]	40	39	39	39
Monthly Expenditure Per Person on Food				
≤$20	17	18	13	16
$21-30	44	48	44	46
>$30	39	34	43	38
Average Monthly Expenditure Per Person on Food	$ 30	$ 28	$ 30	$ 30
Monthly Health Care Expenditure Per Person				
$0	70	71	64	69
$1-10	15	12	13	13
≥$11	15	17	23	18
Average Monthly Health Care Expenditure Per Person	$ 17	$ 5	$ 11	$ 10
Number of Moves				
0	84	86	88	86
≥1	16	14	12	14
Housing Status				
Rent	64	68	63	66
Own	36	32	37	34
Value of Home[2]				
≤$20,000	85	86	82	85
>$20,000	15	14	18	15
Average Value of Home	$17,394	$17,363	$16,789	$17,429
Monthly Rent[3]				
≤$50	24	23	23	23
$51-100	64	64	65	64
>$100	12	13	12	13
Average Monthly Rent	$ 71	$ 72	$ 75	$ 72

[1] Excludes 577 cases where the father was not present or not employed.

[2] Excludes 615 renters.

[3] Excludes 323 homeowners.

Table 3 (Continued)

Variable Description	Grade Level Four	Five	Six	Total
Number Rooms Per Person				
≤ .5	15	15	18	16
.6-1	42	44	37	42
> 1	43	41	45	41
Average Number of Rooms Per Person	.9	.9	.9	.9
# Bedrooms Per Person				
< .5	41	43	39	42
.5	25	21	22	22
> .5	34	36	39	36
Average # Bedrooms Per Person	.5	.5	.5	.5
Central Heat				
Have Central Heat	88	83	84	84
Do Not Have Central Heat	12	17	16	16
Public Housing Status				
Live in Public Housing	33	29	29	30
Do Not Live in Public Housing	67	71	71	70
Monthly Income				
≤ $400	31	29	26	29
$401-600	22	30	26	27
> $600	47	41	48	44
Average Monthly Income	$601	$583	$622	$598
Monthly Transfer Income				
≤ $100	30	30	30	30
$101-300	42	41	43	42
>$300	28	29	27	28
Average Monthly Transfer Income	$210	$209	$204	$208
Value of Durable Goods				
≤ $500	10	14	10	12
$501-1,000	39	43	38	41
> $1,000	51	43	52	47
Average Value of Durable Goods	$1,097	$992	$1,051	$1,038
Television Set				
Own One	99	98	98	98
Do Not Own One	1	2	2	2
Total Number in Sample	282	430	226	938

TABLE 4

SAMPLE PROFILE:

PERCENTAGE DISTRIBUTION AND AVERAGES OF TWO-YEAR

OBSERVATION SAMPLE CHARACTERISTICS, BY GRADE LEVEL

Variable Description	Grade Level			Total
	Five	Six	Eight	
Days Attended School--Post[1]				
< 160 Days	15	17	11	15
160-169 Days	23	12	15	16
≥ 170 Days	62	71	74	69
Average Days Attended School--Post	169	169	172	170
Days Attended School--Pre				
< 160 Days	7	8	8	8
160-169 Days	18	19	20	19
≥ 170 Days	75	73	72	73
Average Days Attended School--Pre	173	172	172	172
Vocabulary Test Score--Post[2]				
< -10	56	55	68	60
(-10)-(-1)	24	24	18	22
≥ 0	20	21	14	18
Average Vocabulary Test Score--Post	-13	-13	-18	-15
Vocabulary Test Score--Pre				
< -10	30	53	55	49
(-10)-(-1)	46	22	29	30
≥ 0	24	25	16	21
Average Vocabulary Test Score--Pre	-6	-9	-12	-10
Reading Test Score--Post				
< -10	62	65	68	65
(-10)-(-1)	27	18	15	19
≥ 0	11	17	17	16
Average Reading Test Score--Post	-15	-16	-17	-16

[1] Post-attendance figures exclude 212 persons, and pre-attendance figures exclude 10 persons for whom data were missing.

[2] Test Scores are defined as the observed score minus the expected grade equivalent score given the student's grade at the time tested times 10.

Table 4 (Continued)

Variable Description	Grade Level Five	Six	Eight	Total
Reading Test Score--Pre				
< -10	39	47	51	47
(-10)-(-1)	33	36	31	33
≥ 0	28	17	18	20
Average Reading Test Score--Pre	-7	-9	-11	-9
# Children in Family				
1	4	8	4	5
2-3	33	29	30	30
4-5	33	33	34	34
>5	30	30	32	31
Average # Children in Family	5	4	5	5
# Parents Present				
1	59	62	57	59
2	41	38	43	41
Years of Education--Mother[1/]				
<12	63	70	68	67
12	32	26	25	27
13-18	5	4	7	6
Average Years of Education--Mother	10	10	10	10
Years of Education--Father[2/]				
<12	78	77	84	80
12	19	18	13	16
13-18	3	5	3	4
Average Years of Education--Father	9	9	9	9
Hours Per Week Employed--Mother				
0	78	69	74	73
1-20	11	16	12	13
>20	11	15	14	14
Average Hours Per Week Employed--Mother[3/]	23	22	25	23

[1/] Excludes 8 cases where no mother is present.

[2/] Excludes 313 cases where no father is present

[3/] Excludes 128 cases where the mother was not present or not employed.

Table 4 (Continued)

Variable Description	Grade Level Five	Six	Eight	Total
Hours Per Week Employed--Father				
0	5	13	17	13
1-30	15	8	8	10
>30	80	79	75	77
Average Hours Per Week Employed--Father[1/]	37	38	38	38
Monthly Expenditure Per Person on Food				
≤$20	12	17	19	17
$21-30	54	51	57	54
>$30	34	32	24	29
Average Monthly Expenditures Per Person on Food	$ 29	$ 27	$26	$ 28
Monthly Health Care Expenditure Per Person				
$0	46	55	67	58
$1-10	35	28	26	29
≥$11	19	17	7	13
Average Monthly Health Care Expenditure Per Person	$ 6	$ 7	$ 3	$ 5
Number of Moves				
0	75	71	76	74
≥ 1	25	29	24	26
Housing Status				
Rent	64	62	69	65
Own	36	38	31	35
Value of Home[2/]				
≤$20,000	85	90	87	88
>$20,000	15	10	13	12
Average Value of Home	$15,981	$14,876	$13,745	$14,745
Monthly Rent[3/]				
≤$50	25	23	17	21
$51-100	64	67	76	70
>$100	11	10	7	9
Average Monthly Rent	$72	$73	$70	$71

[1/] Excludes 223 cases where the father was not present or not employed.

[2/] Excludes 374 renters.

[3/] Excludes 200 homeowners.

Table 4 (Continued)

Variable Description	Grade Level Five	Six	Eight	Total
Number Rooms Per Person				
≤ .5	16	15	11	13
.6-1	46	44	50	47
> 1	38	41	39	40
Average Number of Rooms Per Person	.9	.9	.9	.9
# Bedrooms Per Person				
< .5	50	43	49	47
.5	17	23	14	18
> .5	33	34	37	35
Average # Bedrooms Per Person	.5	.5	.5	.5
Central Heat				
Have Central Heat	87	81	81	82
Do Not Have Central Heat	13	19	19	18
Public Housing Status				
Live in Public Housing	34	35	34	34
Do Not Live in Public Housing	66	65	66	66
Monthly Income				
≤ $400	29	27	30	28
$401-600	20	26	30	26
> $600	51	47	40	46
Average Monthly Income	$611	$603	$563	$589
Monthly Transfer Income				
≤ $100	29	28	30	29
$101-300	40	43	45	43
> $300	31	29	25	28
Average Monthly Transfer Income	$214	$207	$197	$205
Value of Durable Goods				
≤ $500	8	13	18	14
$501-1,000	44	46	52	48
> $1,000	48	41	30	38
Average Value of Durable Goods	$1,088	$978	$845	$951
Television Set				
Own One	100	97	98	98
Do Not Own One	0	3	2	2
Total Number in Sample	132	215	227	574

TABLE 5

DEFINITION OF VARIABLES

Variable	Description
Outcome Measures	
VOCAB	Grade Equivalent Score on Vocabulary Section of Iowa Test of Basic Skills
READ	Grade Equivalent Score on Reading Section of Iowa Test of Basic Skills
ATTEND	180 Minus the Number of Days Absent From School
VOCLAG	Grade Equivalent Score on Vocabulary Section of Iowa Test of Basic Skills Taken One or Two Years Prior to VOCAB
RDLAG	Grade Equivalent Score on Reading Section of Iowa Test of Basic Skills Taken One or Two Years Prior to READ
ATNDLAG	180 Minus the Number of Days Absent From School During the Year Preceding or the Second Year Preceding ATTEND
Home Environment Factors	
HRSM >20	1 if Mother Works More than 20 Hours Per Week and 0 Otherwise
HRSF >30	1 if Father Works More than 30 Hours Per Week and 0 Otherwise
Rooms $\geq$ 1	1 if at Least 1 Room Per Person and 0 Otherwise
BDRM.5	1 if .5 Bedrooms Per Person and 0 Otherwise
BDRM >.5	1 if More than .5 Bedrooms Per Person and 0 Otherwise
RENT	Average Rental Value of Dwelling Unit
OWN	1 if Family Owns Home and 0 if Rents
MOVE	1 if Family Moved and 0 Otherwise
PUBLH	1 if Live in Public Housing and 0 Otherwise
HEATA	1 if Home Has Central Heat and 0 Otherwise
FOOD >30	1 if Monthly Expenditures Per Person on Food Exceeds $30 and 0 Otherwise
MEDICAL >0	1 if Monthly Expenditures Per Person on Medical Care Exceeds $0 and 0 Otherwise

Table 5 (Continued)

Variable	Description
TV	1 if Family Owns TV and 0 Otherwise
ASSETS >1000	1 if Value of Assets (Excluding Home and Automobiles) Exceeds $1000 and 0 Otherwise
INC 4-600	1 if Monthly Income Exceeds $400 But Is Less than or Equal to $600 and 0 Otherwise
INC >600	1 if Monthly Income Exceeds $600 and 0 Otherwise
WELF 1-300	1 if Monthly Welfare Income Exceeds $100 But Is Less than or Equal to $300 and 0 Otherwise
WELF >300	1 if Monthly Welfare Exceeds $300 and 0 Otherwise
GX	1 if Family Was Enrolled in Payments Group of Gary Income Maintenance Experiment and 0 Otherwise
Other Factors	
KIDS 23	1 if Number of Children in Family Equals 2 or 3 and 0 Otherwise
KIDS 45	1 if Number of Children in Family Equals 4 or 5 and 0 Otherwise
KIDS >5	1 if Number of Children in Family Exceeds 5 and 0 Otherwise
PARENTS 2	1 if Two Parents Are Present and 0 Otherwise
EDM $\geq$12	1 if Mother Completed 12 or More Years of Schooling and 0 Otherwise
EDF $\geq$12	1 if Father Completed 12 or More Years of Schooling and 0 Otherwise
FEMALE	1 if Child Is Female and 0 Otherwise
GRADE 5	1 if Child Is in Fifth Grade and 0 Otherwise
GRADE 6	1 if Child Is in Sixth Grade and 0 Otherwise
GRADE 81	1 if Child Is in Eighth Grade in 1973-74 and 0 Otherwise
GRADE 82	1 if Child Is in Eighth Grade in 1972-73 and 0 Otherwise
S_i	1 if Child Attended School "i" During the Year in Which the Outcome Variable Was Measured and 0 Otherwise ($i = 1, \ldots, n$)

TABLE 6

MEANS AND STANDARD DEVIATIONS OF ANALYSIS VARIABLES

VARIABLE	SAMPLE							
	ONE-YEAR OBSERVATION				TWO-YEAR OBSERVATION			
	Lower Performers		Higher Performers		Lower Performers		Higher Performers	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd
VOCAB	41.49	14.04	51.89	15.07	51.95	16.23	62.27	17.43
READ	39.88	10.20	49.01	13.39	51.53	14.89	60.11	16.86
ATTEND[1/]	167.63	12.83	169.63	12.48	169.00	11.44	168.42	13.14
VOCLAG	30.27	7.77	46.61	11.63	33.20	8.74	50.11	11.78
RDLAG	32.74	8.45	42.20	11.60	37.26	11.02	46.50	12.86
ATNDLAG[1/]	169.33	12.11	170.63	10.81	169.88	11.89	170.88	10.59
HRSM >20	.12	.33	.14	.35	.12	.32	.16	.37
HRSF >30	.33	.47	.39	.49	.32	.47	.39	.49
ROOMS ≥1	.39	.49	.46	.50	.36	.48	.43	.50
BDRM .5	.20	.40	.24	.43	.17	.38	.19	.39
BDRM >.5	.34	.47	.38	.48	.30	.46	.39	.49
RENT	83.51	42.15	85.06	36.51	79.53	33.08	83.60	30.93
OWN	.26	.44	.42	.49	.27	.44	.42	.49
MOVE	.15	.36	.13	.34	.27	.44	.25	.44
PUBLH	.32	.47	.29	.45	.36	.48	.33	.47
HEATA	.83	.38	.86	.35	.80	.40	.84	.37
FOOD >30	.32	.47	.43	.50	.23	.42	.35	.48
MEDICAL >0	.33	.47	.30	.46	.40	.49	.44	.50
TV	.98	.12	.98	.13	.99	.13	.98	.13
ASSETS >1000	.46	.50	.50	.50	.34	.47	.43	.50
INC 4-600	.30	.46	.23	.42	.30	.46	.22	.42
INC >600	.42	.49	.47	.50	.41	.49	.50	.50
WELF 1-300	.40	.49	.43	.50	.40	.49	.46	.50
WELF >300	.32	.47	.25	.44	.33	.47	.23	.42
SM	.56	.50	.53	.50	.59	.49	.57	.50
KIDS 23	.27	.44	.31	.46	.24	.43	.35	.48
KIDS 45	.32	.47	.35	.48	.39	.49	.30	.46
KIDS >5	.52	.50	.44	.50	.33	.47	.29	.45
PARENTS 2	.39	.49	.45	.50	.36	.48	.45	.50
EDM ≥ 12	.27	.44	.40	.49	.25	.43	.39	.49
EDF ≥ 12	.07	.25	.13	.34	.05	.21	.10	.34
FEMALE	.47	.50	.54	.50	.50	.50	.56	.50
Number In Sample	443		495		278		296	

[1/] Includes all individuals for whom pre- and post-attendance data are available.

TABLE 7a

CORRELATIONS AMONG SELECTED ANALYSIS VARIABLES--TOTAL ONE-YEAR OBSERVATION SAMPLE

	VOCAB	READ	ATTEND	HRSM > 20	HRSF > 30	ROOMS ≥1	BDRM .5	BDRM >.5	RENT	OWN	MOVE	PUBLH	HEATA	FOOD >30	MEDICAL >0	TV	ASSETS>1000	INC 4-600	INC >600	WELF 1-300	WELF >300	GX	KIDS 23	KIDS 45	KIDS >5	PARENTS 2	EDM ≥12	EDF ≥12	FEMALE
VOCAB	1.00																												
READ	.71	1.00																											
ATTEND	.11	.12	1.00																										
VOCLAG	.55	.59	.09																										
RDLAG	.53	.65	.14																										
ATNDLAG	.09	.11	.46																										
HRSM >20	.06	.06	-.01	1.00																									
HRSF >30	.02	.04	.08	-.01	1.00																								
ROOMS ≥1	.09	.09	.04	.08	-.23	1.00																							
BDRM .5	.06	.04	-.04	.08	-.05	.01	1.00																						
BDRM >.5	.07	.09	.04	.03	-.18	.65	-.40	1.00																					
RENT	-.01	.01	.04	.15	.30	.03	.01	.00	1.00																				
OWN	.04	.13	.10	.08	.38	.02	.00	.03	.43	1.00																			
MOVE	-.09	-.08	-.06	-.01	-.09	.02	.04	.05	.07	-.02	1.00																		
PUBLH	.04	-.01	-.09	-.15	-.22	-.10	.04	-.03	-.46	-.44	-.05	1.00																	
HEATA	.04	.03	-.04	-.03	.04	.07	.04	.09	.08	.22	-.03	.18	1.00																
FOOD>30	.16	.15	.03	.06	-.00	.38	.04	.32	.03	.11	.01	-.06	.06	1.00															
MEDICAL >0	-.05	-.01	-.03	.03	.23	-.10	-.06	-.06	.08	.07	-.11	.02	.06	.02	1.00														
TV	-.01	-.01	-.00	.00	.08	-.03	-.01	-.03	.03	.08	-.05	.01	-.01	-.04	.07	1.00													
ASSETS>1000	.02	.03	.01	.07	.12	.08	.00	.05	.21	.20	-.02	-.07	.16	.15	.10	.09	1.00												
INC 4-600	-.02	-.03	-.07	-.02	-.25	-.06	-.05	.01	-.10	-.16	.02	.14	-.01	-.07	-.08	-.00	-.08	1.00											
INC >600	-.01	.05	.09	.19	-.62	-.24	-.02	-.22	.28	.41	-.08	-.20	.11	-.05	.19	.10	.12	-.54	1.00										
WELF 1-300	.02	-.02	.05	.03	-.10	.15	.01	.06	-.04	-.09	-.02	.00	-.03	.10	-.03	-.06	.01	-.14	-.09	1.00									
WELF >300	-.08	-.05	-.12	.14	-.36	-.22	-.02	-.13	-.23	-.24	.03	.30	-.01	-.20	-.06	.01	-.12	.17	-.20	-.54	1.00								
GX	-.01	.05	-.06	.04	.03	-.00	-.01	-.00	.05	.10	-.06	.09	.05	-.01	.11	.04	.02	.02	.14	.02	.27	1.00							
KIDS 23	.09	.08	.02	.05	-.02	.52	.06	.36	.00	-.01	.04	-.07	-.03	.27	-.08	-.05	.07	-.09	-.12	.05	-.20	-.04	1.00						
KIDS 45	-.05	-.05	.03	.03	-.05	-.13	.12	-.09	-.03	-.03	.03	-.03	-.08	-.03	.03	.02	-.10	.08	-.03	.02	.01	.04	-.45	1.00					
KIDS >5	-.10	-.08	-.08	-.05	.13	-.51	-.15	0.38	.07	.04	-.03	.08	.12	-.34	.05	.05	.03	.06	.21	-.12	.25	.01	-.44	-.49	1.00				
PARENTS 2	.00	.04	.07	.05	.82	-.25	-.01	-.22	.26	.38	-.14	-.19	.05	-.06	.27	.06	.13	-.18	.57	-.10	-.30	.13	-.06	-.05	.14	1.00			
EDM ≥ 12	.06	.07	.04	.12	.04	.20	-.07	.17	.04	.09	-.01	-.09	-.01	.19	-.03	-.04	.00	-.02	-.01	.13	-.18	-.03	.15	-.01	-.18	-.03	1.00		
EDF ≥ 12	.04	.06	.04	.00	.40	-.01	-.00	.04	.21	.20	.04	-.08	.09	.08	.11	.02	.10	-.11	.25	-.04	-.17	.02	.13	-.07	-.02	.34	.15	1.00	
FEMALE	.05	.17	-.02	.01	.07	-.00	.02	.01	.04	-.02	.10	.04	.00	-.00	-.05	-.02	-.01	-.00	-.01	-.03	.04	-.03	-.01	-.07	-.04	-.06	-.01	-.06	1.00

TABLE 7b

CORRELATIONS AMONG SELECTED ANALYSIS VARIABLES--TOTAL TWO-YEAR OBSERVATION SAMPLE

	VOCAB	READ	ATTEND	HRSM >20	HRSF >30	ROOMS ≥1	BDRM .5	BDRM >.5	RENT	OWN	MOVE	PUBLH	HEATA	FOOD >30	MEDICAL >0	TV	ASSETS>1000	INC 4-600	INC >600	WELF 1-300	WELF >300	GX	KIDS 23	KIDS 45	KIDS >5	PARENTS 2	EDM ≥12	EDF ≥12	FEMALE
VOCAB	1.00																												
READ	.66	1.00																											
ATTEND	.14	.17	1.00																										
VOCLAG	.54	.61	.04																										
RDLAG	.59	.73	.11																										
ATNDLAG	.08	.11	.35																										
HRSM >20	.07	.07	.05	1.00																									
HRSF >30	.05	.09	.10	.01	1.00																								
ROOMS ≥1	.08	.06	.06	.14	-.23	1.00																							
BDRM .5	-.03	-.01	-.05	.01	-.02	-.00	1.00																						
BDRM >.5	.12	.07	.08	.13	-.16	.70	-.34	1.00																					
RENT	.02	.03	.01	.08	.35	.01	-.04	.01	1.00																				
OWN	.03	.12	.08	.08	.42	-.02	.03	.01	.44	1.00																			
MOVE	-.03	.04	-.13	.01	-.12	.11	.03	.08	.18	-.01	1.00																		
PUBLH	-.00	-.05	-.08	-.12	-.24	-.07	.09	.01	-.46	-.38	.03	1.00																	
HEATA	.01	.04	-.02	-.05	.05	.01	.05	.03	.06	.24	-.02	.22	1.00																
FOOD>30	.09	.04	.06	.14	-.03	.39	-.00	.38	.03	.01	.00	-.02	-.01	1.00															
MEDICAL >0	-.05	-.05	.01	-.03	.31	-.10	-.06	-.02	.14	.21	-.08	-.06	.08	.03	1.00														
TV	-.01	.02	-.02	.02	.07	-.00	-.01	-.04	.04	.07	.05	.01	.01	-.15	.06	1.00													
ASSETS>1000	.00	-.02	.06	.10	.15	.05	.01	.04	.23	.25	-.01	-.08	.13	.11	.16	.08	1.00												
INC 4-600	-.03	-.04	-.08	-.06	-.28	.00	.04	.01	-.16	-.17	-.06	.19	.03	-.02	-.16	-.01	-.09	1.00											
INC >600	.02	.06	.10	.20	.62	-.27	-.04	-.17	.37	.45	-.04	-.21	.08	-.04	.30	.07	.19	-.54	1.00										
WELF 1-300	.11	.04	.03	-.03	-.14	.20	.00	.12	-.08	-.11	-.00	.04	.05	.10	-.05	-.07	-.01	-.00	-.18	1.00									
WELF >300	-.17	-.15	-.15	-.12	-.35	-.26	-.02	-.19	-.21	-.23	.06	.26	-.07	-.24	-.13	-.01	-.11	.16	-.13	-.54	1.00								
GX	.01	.01	-.06	-.05	.01	-.00	-.01	.02	.04	.07	-.04	.04	.00	-.04	.17	-.06	.00	-.06	-.15	.00	.26	1.00							
KIDS 23	.03	.03	.07	.15	-.06	.54	.02	.40	-.03	-.03	.07	-.09	-.02	.25	-.09	-.09	.01	-.06	-.11	.11	-.23	-.09	1.00						
KIDS 45	-.04	-.01	-.05	-.05	-.02	-.18	.17	-.14	-.01	-.05	-.04	.03	-.04	-.02	.01	.07	-.02	.07	-.05	.03	-.02	.05	-.47	1.00					
KIDS >5	-.06	-.03	-.03	-.08	.13	-.50	-.17	-.39	.09	.11	-.00	.07	.11	-.36	.09	.09	.03	.01	.25	-.21	.31	.01	-.44	-.48	1.00				
PARENTS 2	.07	.12	.09	-.08	.74	-.26	-.02	-.20	.30	.39	-.20	-.23	.05	-.07	.37	.08	.12	-.21	.54	-.13	-.31	.12	-.10	-.02	.13	1.00			
EDM ≥ 12	.10	.11	.06	.19	.06	.14	-.06	.17	.08	.11	.01	-.04	-.02	.16	-.02	-.05	.08	-.08	.10	.01	-.12	.01	.16	-.06	-.12	.02	1.00		
EDF ≥ 12	.05	.09	.02	-.00	.37	.03	-.01	.07	.27	.25	.02	-.13	.05	.08	.15	.04	.10	-.16	.29	-.05	-.17	.05	.12	-.02	-.07	.32	.22	1.00	
FEMALE	.11	.16	-.04	-.03	-.03	.01	-.06	.07	.03	-.02	.08	.05	.01	-.02	-.02	.04	-.03	-.04	-.01	.03	-.02	-.04	.00	.01	-.00	-.03	-.01	-.01	1.00

TABLE 8

ESTIMATED REGRESSION COEFFICIENTS FOR

VOCABULARY TEST SCORES--ONE-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	-2.10	-1.04	1.48	0.82
HRSF >30	3.80	1.51	1.15	0.48
ROOMS ≥1	-2.74	-1.30	-1.56	-0.81
BDRM .5	-0.23	-0.13	3.30*	1.87
BDRM >.5	-1.42	-0.69	2.26	1.12
RENT	0.03	1.55	0.00	0.14
OWN	-0.72	-0.37	-2.37	-1.39
MOVE	-2.35	-1.25	-1.93	-1.09
PUBLH	1.10	0.59	-0.25	-0.13
HEATA	0.60	0.32	1.41	0.71
FOOD >30	1.49	0.98	2.45*	1.86
MEDICAL >0	-5.22**	-3.70	0.80	0.63
TV	0.94	0.19	2.71	0.60
ASSETS >1000	-0.05	-0.03	0.51	0.43
INC 4-600	0.64	0.34	1.51	0.84
INC >600	-0.41	-0.18	0.27	0.13
WELF 1-300	0.11	0.06	-1.32	-0.82
WELF >300	-0.50	-0.21	-1.80	-0.80
GX	-0.50	-0.33	-0.38	-0.28

Table 8 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	-3.88	-1.10	-2.07	-0.83
KIDS 45	-7.42*	-1.95	-3.44	-1.23
KIDS >5	-8.20**	-1.98	-4.02	-1.25
PARENTS 2	-3.19	-1.41	0.64	0.27
EDM $\geq$12	-1.48	-0.98	2.70**	2.15
EDF $\geq$12	-1.31	-0.48	-1.58	-0.82
FEMALE	0.95	0.74	0.79	0.69
GRADE 5	-0.10	-0.05	3.53**	2.32
GRADE 6	9.24**	3.86	10.16**	4.36
VOCLAG	0.25**	2.42	0.47**	6.24
Number of School Dummies in Regression	16		15	
$\bar{R}^2$	0.22		0.37	
N	443		495	
Mean of Dependent Variable	41.49		51.89	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

TABLE 9

ESTIMATED REGRESSION COEFFICIENTS FOR

READING TEST SCORES--ONE-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	-0.52	-0.37	0.70	0.49
HRSF >30	-1.39	-0.79	1.99	1.05
ROOMS ≥1	-0.86	-0.58	-1.51	-0.98
BDRM .5	2.09	1.63	1.50	1.07
BDRM >.5	1.86	1.29	0.56	0.34
RENT	0.00	0.04	0.01	0.79
OWN	1.01	0.73	-0.22	-0.16
MOVE	-2.04	-1.56	-2.77*	-1.95
PUBLH	0.72	0.55	-0.16	-0.10
HEATA	-0.32	-0.24	-0.01	-0.00
FOOD >30	2.04*	1.92	1.30	1.24
MEDICAL >0	-1.57	-1.58	0.36	0.35
TV	4.46	1.26	1.03	0.28
ASSETS >1000	0.00	0.00	0.56	0.59
INC 4-600	1.89	1.45	0.11	0.08
INC >600	1.24	0.78	0.17	0.11
WELF 1-300	-1.05	-0.82	0.00	0.00
WELF >300	-0.56	-0.34	1.93	1.08
GX	0.74	0.69	0.48	0.45

Table 9 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	-1.28	-0.52	-1.08	-0.54
KIDS 45	0.06	0.03	-4.01*	-1.79
KIDS >5	-0.41	-0.14	-3.83	-1.50
PARENTS 2	-0.94	-0.60	-0.20	-0.11
EDM $\geq$12	-0.67	-0.63	1.70*	1.72
EDF $\geq$12	1.33	0.69	-0.37	-0.24
FEMALE	2.88**	3.23	1.37	1.48
GRADE 5	1.70	1.33	1.40	1.26
GRADE 6	6.74**	4.33	6.61**	4.23
RDLAG	0.28**	4.46	0.63**	12.58
Number of School Dummies in Regression	16		15	
$\bar{R}^2$	0.27		0.50	
N	443		495	
Mean of Dependent Variable	39.88		49.01	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

TABLE 10

ESTIMATED REGRESSION COEFFICIENTS FOR

ATTENDANCE--ONE-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	-0.79	-0.46	-0.74	-0.46
HRSF >30	0.39	0.20	-0.59	-0.28
ROOMS ≥1	2.12	1.28	0.14	0.10
BDRM .5	-1.60	-1.05	-1.03	-0.69
BDRM >.5	1.61	0.97	-0.67	-0.40
RENT	0.00	0.00	0.03	1.32
OWN	-1.40	-0.89	0.64	0.42
MOVE	-1.43	-0.98	-1.90	-1.33
PUBLH	0.31	0.22	1.19	0.74
HEATA	-3.43**	-2.18	1.23	0.77
FOOD >30	0.59	0.46	-0.82	-0.67
MEDICAL >0	-2.39**	-2.04	1.81	1.58
TV	0.45	0.10	-1.43	-0.37
ASSETS >1000	-0.38	-0.36	-1.04	-0.99
INC 4-600	2.37	1.61	-0.41	-0.28
INC >600	2.71	1.53	2.69	1.49
WELF 1-300	0.05	0.00	0.41	0.28
WELF >300	0.39	0.20	-1.40	-0.70
GX	-3.26**	-2.71	-0.78	-0.66

Table 10 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	1.09	0.41	-1.41	-0.62
KIDS 45	0.98	0.35	-2.00	-0.79
KIDS >5	-0.59	-0.17	-3.76	-1.32
PARENTS 2	3.65*	1.90	1.80	0.94
EDM $\geq$12	0.02	0.00	-0.13	-0.10
EDF $\geq$12	0.99	0.47	1.00	0.57
FEMALE	0.69	0.66	0.36	0.35
GRADE 5	-0.37	-0.22	0.20	0.17
GRADE 6	-1.49	-0.91	0.28	0.17
ATNDLAG	0.52**	12.14	0.52**	10.88
Number of School Dummies in Regression	21		14	
$\bar{R}^2$	0.33		0.22	
N	482		536	
Mean of Dependent Variable	167.63		169.63	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

TABLE 11

ESTIMATED REGRESSION COEFFICIENTS FOR

VOCABULARY TEST SCORES--TWO-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	4.08	1.32	-2.23	-0.82
HRSF >30	6.65**	1.96	-3.94	-1.28
ROOMS ≥1	-0.45	-0.14	-3.53	-1.09
BDRM .5	-0.93	-0.33	1.66	0.57
BDRM >.5	0.89	0.26	3.05	0.94
RENT	0.04	1.10	-0.00	-0.00
OWN	-0.16	-0.00	0.00	0.00
MOVE	-2.72	-1.18	0.34	0.14
PUBLH	0.52	0.20	1.65	0.62
HEATA	-1.22	-0.47	4.27	1.47
FOOD >30	1.16	0.47	1.32	0.58
MEDICAL >0	-0.03	-0.00	-1.37	-0.73
TV	5.22	0.72	6.43	0.92
ASSETS >1000	1.08	0.52	1.97	1.05
INC 4-600	2.33	0.93	-2.91	-1.06
INC >600	0.29	0.10	1.75	0.55
WELF 1-300	5.72**	2.07	-0.87	-0.35
WELF >300	5.01	1.36	-5.50	-1.47
GX	-0.33	-0.14	-2.50	-1.18

Table 11 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	-11.45**	-2.26	-6.87*	-1.69
KIDS 45	-9.75*	-1.70	-8.49*	-1.88
KIDS >5	-8.65	-1.33	-10.17**	-1.99
PARENTS 2	-1.24	-0.40	2.81	0.88
EDM $\geq$12	0.50	0.22	4.20**	2.17
EDF $\geq$12	-1.47	-0.32	-3.20	-1.07
FEMALE	3.15*	1.68	1.99	1.14
GRADE 6	6.79**	1.97	9.28**	3.42
GRADE 81	16.50**	2.25	14.67*	1.79
GRADE 82	18.81**	2.47	18.90**	2.27
VOCLAG	0.20	1.25	0.44**	3.67
Number of School Dummies in Regression	13		14	
$\bar{R}^2$	0.21		0.36	
N	278		296	
Mean of Dependent Variable	51.95		62.27	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

TABLE 12

ESTIMATED REGRESSION COEFFICIENTS FOR

READING TEST SCORES--TWO-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	0.27	0.10	-1.18	-0.56
HRSF >30	-1.35	-0.54	-0.88	-0.37
ROOMS $\geq$1	-0.23	-0.10	-1.72	-0.68
BDRM .5	-0.57	-0.28	0.32	0.14
BDRM >.5	1.42	0.58	-1.10	-0.44
RENT	-0.00	-0.10	-0.01	-0.42
OWN	-2.75	-1.35	2.30	1.09
MOVE	1.11	0.66	1.73	0.99
PUBLH	-1.23	-0.66	0.09	0.00
HEATA	-0.56	-0.29	1.11	0.49
FOOD >30	1.05	0.57	2.02	1.16
MEDICAL >0	-3.05*	-1.81	0.88	0.61
TV	0.56	0.10	6.77	1.25
ASSETS >1000	1.13	0.73	0.82	0.57
INC 4-600	2.30	1.24	-1.06	-0.50
INC >600	3.21	1.38	0.66	0.26
WELF 1-300	-0.54	-0.26	0.91	0.46
WELF >300	-1.28	-0.47	3.19	1.10
GX	1.18	0.71	-3.33**	-2.04

Table 12 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	-0.83	-0.22	-0.83	-0.26
KIDS 45	3.78	0.91	-3.60	-1.03
KIDS > 5	3.04	0.63	-5.74	-1.46
PARENTS 2	1.38	0.61	4.53*	1.83
EDM $\geq$ 12	1.35	0.82	2.37	1.58
EDF $\geq$ 12	4.76	1.35	-2.50	-1.08
FEMALE	1.91	1.37	2.90**	2.14
GRADE 6	3.61	1.53	5.38**	2.84
GRADE 81	12.18**	2.19	6.56	1.04
GRADE 82	15.81**	2.75	8.70	1.33
RDLAG	0.48**	5.11	0.85**	11.87
Number of School Dummies in Regression	13		14	
$\bar{R}^2$	0.50		0.59	
N	278		296	
Mean of Dependent Variable	51.53		60.11	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

TABLE 13

ESTIMATED REGRESSION COEFFICIENTS FOR

ATTENDANCE--TWO-YEAR OBSERVATION SAMPLE

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Modifiable Home Environment Factors				
HRSM >20	0.21	0.10	-1.25	-0.54
HRSF >30	-0.86	-0.33	0.86	0.35
ROOMS ≥1	0.72	0.28	-2.11	-0.81
BDRM .5	1.88	0.95	-1.95	-0.84
BDRM >.5	1.44	0.58	1.32	0.53
RENT	-0.01	-0.22	0.05	1.51
OWN	0.24	0.10	-2.28	-0.98
MOVE	0.39	0.24	-3.68**	-2.12
PUBLH	0.54	0.28	-1.41	-0.65
HEATA	-2.77	-1.50	1.28	0.59
FOOD >30	0.60	0.33	0.36	0.20
MEDICAL >0	-0.84	-0.56	-0.78	-0.50
TV	-2.48	-0.39	14.49**	2.51
ASSETS >1000	0.69	0.48	-0.13	-0.10
INC 4-600	2.74	1.39	-3.80*	-1.80
INC >600	2.42	1.06	1.02	0.41
WELF 1-300	1.41	0.71	2.67	1.33
WELF >300	2.21	0.84	-0.86	-0.30
GX	-2.80*	-1.70	-2.80	-1.62

Table 13 (Continued)

Independent Variable	Sample: Lower Performers Coefficient	Lower Performers t-ratio	Higher Performers Coefficient	Higher Performers t-ratio
Other Factors				
KIDS 23	-2.70	-0.82	4.24	1.44
KIDS 45	-0.10	-0.00	0.35	0.10
KIDS > 5	-1.70	-0.41	0.35	0.10
PARENTS 2	2.26	0.94	-0.82	-0.33
EDM $\geq$ 12	1.24	0.80	0.79	0.49
EDF $\geq$ 12	-0.43	-0.17	2.44	1.01
FEMALE	2.55*	1.89	1.38	0.96
GRADE 6	-3.41	-1.42	2.43	1.49
GRADE 81	-2.22	-0.42	5.14	1.05
GRADE 82	-1.31	-0.26	6.02	1.32
ATNDLAG	0.45**	7.45	0.42**	5.99
Number of School Dummies in Regression	15		13	
$\bar{R}^2$	0.22		0.27	
N	267		291	
Mean of Dependent Variable	169.00		168.42	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

REFERENCES

Aaron, H. "Healthy, Wealthy and Wise: Backdoor Approaches to Education." Unpublished Manuscript, The Brookings Institution, 1977.

Angoff, W. "Scales, Norms and Equivalent Scores." In Educational Measurement, edited by R. L. Thorndike, 2nd ed. Washington, D.C.: American Council on Education, 1971.

Averch, H., Caroll, S., Donaldson, T., Kiesling, H., and Pincus, J. "How Effective is Schooling?" A Critical Review and Synthesis of Research Findings. Santa Monica, California: The Rand Corporation, 1972.

Birch, H. and Gussow, J. Disadvantaged Children: Health, Nutrition and School Failure. New York: Harcourt, Brace and World, Inc., 1970.

Butler, A. Current Research in Early Childhood Education: A Compilation and Analysis for Program Planners. Washington, D.C.: American Association of Elementary-Kindergarden-Nursery Educators, NEA Center, 1970.

Coleman, J.S. et al. Equality of Educational Opportunity. Washington, D.C.: U.S. Department of Health, Education, and Welfare, OE-38001, 1966.

Dugan, D. The Impact of Parental and Educational Investments Upon Student Achievement. Washington, D.C.: U.S. Government Printing Office, 1969.

Duncan, G. "Educational Attainment." Chapter 7 of Five Thousand American Families--Patterns of Economic Progress: An Analysis of the First Five Years of the Panel Study of Income Dynamics, Volume 1, edited by James N. Morgan et al. Ann Arbor: Institute for Social Research, University of Michigan, 1974.

Flanagan, J. Studies of the American High School. Project TALENT, University of Pittsburgh, 1962.

Good, T., Biddle, B., and Brophy, J. Teachers Make a Difference. New York: Holt, Rinehart, and Winston, 1975.

Gordon, I. On Early Learning: The Modifiability of Human Potential. Washington, D.C.: Association for Supervision and Curriculum Development, 1971.

Hannan, M. and Young, A. "Estimation in Panel Models: Results on the Pooling of Cross-Sections and Time Series." Mimeograph, Stanford University, 1974.

Heber, R. Rehabilitation of Families at Risk for Mental Retardation. Madison, Wisconsin: University of Wisconsin, 1973.

Heilbrun, J. Urban Economics and Public Policy. New York: St. Martin's Press, 1973.

Hill, C. and Stafford, F. "Allocation of Time to Preschool Children and Educational Opportunity." Mimeograph, Ann Arbor, 1972.

Hoffman, H. and Nye, F. Working Mothers. San Francisco, California: Jossey-Bass Publishers, 1974.

Hurley, R. Poverty and Mental Retardation: A Causal Relationship. New York: Random House, 1969.

Jencks, C. Inequality. New York: Basic Books, Inc., 1972.

Kaplan et al. "The Efficacy of a Comprehensive Health Care Project: An Empirical Analysis." American Journal of Public Health 62, July 1972, pp. 924-930.

Kehrer, K. et al. "The Gary Income Maintenance Experiment: Design, Administration, and Data Files." Indiana University Northwest, 1975.

Liebowitz, A. "Home Investments in Children." Journal of Political Economy 82, March/April 1974, pp. S111-131.

Liebowitz, A. "Parental Inputs and Children's Achievement." Journal of Human Resources 12, Spring 1977, pp. 242-251.

Lindert, P. "Family Inputs and Inequality Among Children." Institute for Research on Poverty Discussion Paper, Number 218-74. Madison, Wisconsin: University of Wisconsin, 1974.

Maller, C. "Labor Force Participation and School Enrollment Among Adults." In The New Jersey Income-Maintenance Experiment, vol. 2, Labor-Supply Responses, edited by Harold W. Watts and Albert Rees. New York: Academic Press, 1977.

Mallar, C. "The Effects of Income Maintenance on the Productive Activities of Young Adults." Unpublished Ph.D. Dissertation, University of Wisconsin, 1975.

Maynard, R. "An Analysis of Home Environmental Determinants of School Performance." Unpublished Ph.D. Dissertation, University of Wisconsin, 1975.

Maynard, R. "The Effects of the Rural Income Maintenance Experiment on the School Performance of Children." American Economic Review 67, February 1977a, pp. 370-375.

Maynard, R. "Public Policy Means to Affect School Performance in Rural Areas." Mathematica Policy Research, 1977b.

Murnane, R. The Impact of School Resources on the Learning of Inner City Children. Cambridge, Mass.: Ballinger Publishing Company, 1975.

Parker, R. Overview of Cognitive and Language Programs for Three-, Four-, and Five-Year-Old Children. New York: Center for Study in Education, City University of New York, 1970.

Summers, A. and Wolfe, B. "Which School Resources Help Learning? Efficiency and Equity in Philadelphia Public Schools." Business Review, Federal Reserve Bank of Philadelphia, February 1975.

Wilner, D. and Walkley, R. Effects of Housing on Health and Performance." In The Urban Condition, edited by Leonard Duhl, M.D. New York: Basic Books, Inc., 1963.

Wray, J. "Population Pressure on Families: Family Size and Child Spacing." In Rapid Population Growth: Consequences and Policy Implications, edited by Roger Rovelle. Baltimore: Johns Hopkins University Press, 1971.